XIV. "Account of the Construction of a Standard Barometer, and of the Apparatus and Processes employed in the Verification of Barometers at the Kew Observatory." By JOHN WELSH. Communicated by J. P. GASSIOT, Esq., F.R.S., Chairman of the Kew Observatory Committee of the British Association.

(Abstract.)

After stating the results of experiments, made under the superintendence of the Kew Committee, for the construction of a barometer tube of large diameter by the usual method of boiling the mercury in the tube, the author proceeds to describe a method of filling a tube with the aid of an air-pump. In this process, which is fully detailed in the paper, the tube is so constructed, that when the air has been extracted from it, the mercury enters by atmospheric pressure, provision being made for entirely removing the air which the air-pump has failed to extract. By this method a barometer tube of 1·1 inch internal diameter has been satisfactorily prepared at the Kew Observatory. The author then describes the mounting and mode of observing the standard barometer, proceeds to explain the processes adopted in the verification of barometers, and gives a detailed description of the apparatus for determining the errors of barometers at different atmospheric pressures.

XV. "On the Aurora." By REUBEN PHILLIPS, Esq. Communicated by Professor STOKES, Sec. R.S. Received March 7, 1856.

In this paper the author enters into various speculations as to the formation and motion of auroral arches. Since it has been found by experiment that the maximum length of the voltaic arc with a given battery is nearly the same in atmospheric air and in highly rarefied air, forming a very perfect vacuum, the author conceives that a streamer begins as a disruptive discharge of finite and very moderate length, (the maximum length very nearly of a continuous discharge,) which starts upwards from the auroral arch, which he

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regards as the discharging train. If this first portion be not parallel to the dipping-needle, it is moved laterally by virtue of the earth's magnetism, and thus wrenched, as it were, from the spot where it was formed, and extinguished. If, however, the discharge, or any portion of it, be parallel to the dipping-needle, it is not influenced by the earth's magnetism, and remains. To this first length another length may be added by a similar process, and so on, these successive lengths being all parallel to the direction of the first, since otherwise the streamer would be torn asunder by the lateral motion resulting from the earth's magnetism. Thus a straight streamer extends upwards in a direction parallel to the dipping-needle.

If, from some increase in the power of conduction of the arch, the base of the streamer be not necessarily confined to a single spot, then a streamer may be formed which is somewhat inclined to the dipping-needle; but the consecutive elements of such a streamer must be in the same direction, otherwise they would have different lateral motions, the streamer would be divided, and the discharge would cease. The streamer, as a whole, will move from east to west, or from west to east, according to circumstances. Those streamers which would tend to move north or south cannot exist, because their bases would be severed from the auroral arch.

If the discharge take place in air not so very highly rarefied, so that the disruptive discharge is not quite of its maximum length, consecutive elements need not be quite in the same direction in order that the streamer may be unbroken, and thus curved streamers may be formed. It is stated by M. Biot that such have sometimes been observed.

The author then enters into some speculations as to the nature of the auroral arch, which he conceives to consist of nebulous matter highly charged with electricity, and accounts, according to his views, for the motion of such arches from the pole towards the equator.

The remainder of the paper is occupied with speculations as to the nature of fire-ball lightning, and other subjects relating to ordinary electricity.